Memorandum

To:	Josh Wolff, P.E. District Engineer San Lorenzo Valley Water District	**Re:**	2021 Water Master Plan
From:	Tony Akel Akel Engineering Group, Inc.	**Subject:**	Clarifications for Water Master Plan Feedback and Questions Memo Received 11/17/21
Date:	November 30, 2021		

We thank the reviewers for their feedback and comments on the 2021 Water Master Plan. This memorandum documents the clarifications, and for each numbered comment.

No.	Comments	Responses/Clarifications
1	*Did the priorities include our leak heat map? I think we have a heat map now, right? I think James mentioned it was manual.*	Yes, the priorities include the records from the leak map.
2	*Please detail, or point to the place in the document that identifies the entire metadata collected for each inventory classification.*	The system inventories are documented in Chapter 4. Table 4.3 – Pipe Inventory (individual pipe information is maintained in the GIS) Table 4.4 – Storage Reservoirs Table 4.5 – Booster Pump Stations Table 4.6 – Pressure Reducing Valves
3	*Do we have the ability to use the model on our own? What software is required? Patrick's note indicated some open source options available.*	Yes, District staff can use the model, and using the InfoWater Pro software, by Innovyze Inc. The open source Free software option is available (EPANET), though it has modeling limitations. We can export the model to EPANET anytime.
4	*I liked that they attempted to model peak busy hour usage. We need to collect that data. What is required to do so? For example, do we have meters on the exit lines from our wells and treatment plants and are these meters the electronic kind that can collect more granular information?*	Many facilities are collecting information on the busy hour. An implementation plan for collecting and validating the busy hours at all facilities would be the next step.
5	*We own the data and model, correct?*	Yes, the District owns the model data. At this time, the District has not yet purchased the software, and will consider and evaluate when would be a good time to invest in the software.

6		*I believe we already have ESRI. To use this model, do we need a license to InfoWater by Innovyze? If so, how much?*	We do not have the most recent pricing. As an example, and based on 2019 pricing for unlimited number of pipes, the software was at approximately $25,000 for purchase plus $4,100 of annual maintenance cost. If SLVWD is interested in purchasing the software, we can contact the software vendor and obtain an official quote.
7		*Akel refers to our territory as 17.9 square miles. Is that correct?*	The planning area, which includes developable land uses, is at 17.9 square miles. Correct.
8		*They also describe our territory as bounded by Scotts Valley. But in fact we serve part of Scotts Valley. I think this section needs updating.*	Chapter 2, Section 2.1 is intended to provide a very generic description of known *features* surrounding the District.
9.		*Design goals:*	
	a.	*I'm not sure I understand the calculation for peak hour demand: 1.5 x Maximum Day Demand. I may not be reading this correctly but this sounds like our peak hour demand is 1.5 the demand for the entire day on our maximum day. It seems like there should be a division or percent function in there.*	Chapter 3, Section 3.2.3 documents the peak hour demand equation at Peak Hour Demand = 1.5 x Maximum Day Demand Also Peak Hour Demand = 2.25 x Average Day Demand *No division or percent function needed.* It is not uncommon to see peak hour factors in small systems at 3.0 to 3.5 times average day. A peak hour factor of **2.25** time the average day is **not considered to be a high value.**
	a.i.	*For example, in Telecom we typically use a 15 – 17% of daily maximum for maximum peak hour demand.*	
	a.ii.	*Have we ever seen peak hour demand to be 2.25 average day demand? That seems...really high.*	
	b.	*What percentage of current maximum day demand do we have in storage?*	The Water Master Plan storage criteria is documented in Chapter 3, Section 3.4 Required Storage = 50% Maximum Day Demand + Fire storage.
	c.	*Did we put in 8" pipes on the recent new pipes—e.g., California? I thought those were 6". Do we really need 8" for residential distribution lines?*	The pipe size recommendations in this Water Master Plan are based on the hydraulic capacity and fire flow analysis.
	d.	*Fire flow requirements validated with the fire chiefs?*	Criteria for fire flows were validated with District staff, and they are deemed very reasonable for a small system. The minimum single family residential fire flow requirement is typically at 1,500 gpm, while in this Water Master Plan it was

			reduced to 1,000 gpm, in keeping with the local Fire Districts' policies.
	e.	*Is 40 and 80 psi a realistic goal for pressure? What are the numbers today?*	40 and 80 are realistic goals for pressures. SLVWD services a very challenging topography and work very hard to maintain these goals if possible. Some areas will experience pressures higher than 80 psi, and due to the challenging topography. Likewise, some areas will still experience pressures less than 40 psi, also due to challenging topography.
	i.	*As I've been told, there is no legal requirement for this and the District has not attempted to provide this in the past.*	This is a goal for adequate levels of service to customers. Where feasible, the District will consider implementing.
10		*ES-6: The spread between average daily demand and production does not appear to match our current unaccounted for water, which is much higher.*	In the 2021 Water System Master Plan, Unaccounted-For-Water is simply the difference between total annual Production (recorded at facilities) and total annual Consumption (recorded in the water billing records).
11		*The map of our facilities shows three Probation tanks. I thought we had a single big tank now.*	The Water Master Plan shows single Probation Tank, as documented on Table 4.4, and the analysis and hydraulic model document accordingly. The map is showing a typo based on outdated mapping and can be updated in included in an errata document.
12		*Not sure I understand the point behind table ES-2. But it seems to indicate growth where no growth is happening. I must be missing something so please help.*	Table ES.2 does not include or mention Growth. This table documents the existing system demands, and develops factors that were used for estimating water use from possible future growth areas.
13		*Did we model all pressure zones? Or just the 4?*	Figure ES.2 documents 36 pressure zones, all of which were included.
14		*This described metadata: age, diameter, capacity, and material seems more appropriate for pipe only, except perhaps for age. In addition to this, did we also capture if the pipe is buried or not.*	There was no information on any exposed pipelines. Thus, we assumed the distribution pipelines were buried.
	a.	*Other than age, what metadata did we collect on PRVs, Tanks, Pump Stations, etc.?*	Please see response to item 2 above.
	b.	*I'm not sure about the age groupings used. I say this from a financial point of*	The renewal and replacement risk assessment is intended to provide District staff with a list of

		view in trying to avoid "spiking" in pipe replacement requirements just like I'm advocating for avoiding "spiking" in meter deployments. The population in place when that "spiking" occurs gets hit really hard.	priorities, and to be implemented based on available and planned annual budgets, and thus avoiding "spiking".
	c.	*Why would we classify unknown age as "Moderate"? I think there needs to be a bit more review of this as that represents.*	We assumed unknowns to be evenly distributed and thus classified as Moderate.
	d.	*I also did not see anything in detailed criteria about pipeline material, nor is the duration of duty (design life), both of which must also impact the risk factor. Therefore, are we saying that 100% of our system is composed of pipes good for 100 years, regardless of material or design life?*	The Risk Assessment included pipeline age, as documented on Table 8.3, item 1 (Pipe Age), and gave it a 50% weight. This category assigned pipes over 80 years as Extreme. 70-80 years as High, 50-70 years as low, and less than 50 years as Very Low. District Staff will consider existing pipeline materials when budgeting and prioritizing replacement.
15		*What maintenance data was collected by Akel and for what assets?*	Pipe Maintenance data consisted of historical leaks.
16		*Does this mean Akel created a GIS heat map: Maintenance records were spatially matched to pipelines using recorded addresses and pipeline diameters, and are documented on...?*	The historical leaks were matched to pipelines in GIS, based on the database addresses. District staff assisted in this task as many addresses could not be used in GIS. District staff will continue to work on enhancing the collection of the maintenance data.
17		*My concern about Tanks is two-fold:*	The Risk Assessment, Table 8.5 addressed the tank **Material** as follows: Wood was classified as Extreme, Poly was classified as High, Concrete was classified as Low, Steel as Very Low. Material was weighted at 65% of the total LOF score. The Risk Assessment, Table 8.5 addressed the tank **Age** as follows: > 50 years as Extreme, 30-50 years as High, 10-20 years as Low, < 10 years as Very Low. Age was weighted at 25% of the total LOF score.
	a.	*Deterioration of the steel tanks due to being outside of maintenance duration of duty.*	
	i.	*I understand the inventory isn't addressing this. That's fine. IMO, it has to be addressed within the context of finances.*	
	b.	*Redwood and poly tank failure.*	
18		*We appear to have a lot of PRVs that are shaky, meaning likely to fail. It would have been good to put a number by each category.*	The risk assessment for PRVs was based on the available information, and accordingly they were prioritized on Table 8.19.
19		*Pump stations appear to have the most variability between model and actual.*	In actual operations, the pump ramps up slowly and shuts down slowly in order to avoid excessive wear abrupt pressure changes in the system, while the model simulation does not reflect the smooth ramping operation.

			Variations at pumps between actual and model are thus very common, for this reason. The model is intended to reflect system behavior, and during different operational and seasonal demand conditions.
20		*Are the any enforcement requirements from the State for the proposed improvements, in particular the Fire Water flow system in light of the WMP comment "the majority of system hydrants were unable to meet pressure requirements under fire flow conditions"?*	Fire flow requirements are based on District criteria for providing customers with an adequate level of service and adequate level of fire protection, as determined by local Fire Districts and Santa Cruz County.
21		*The District should request all data model output files. The consultant should also export the model to an EPANET file. EPANET is a free open-source modeling software published by the US EPA.*	Yes, an EPANET data export can be done at any time.
22		*The District should double check the RFP tasks. I do not see responsiveness to:*	Future demands are documented on Table 5.2 at 1,964,310 gpd while future lands to be developed were calculated at only 47,564 gpd (a very small percentage of existing water use). Temperature and precipitation forecasts, and specifically droughts, can lead to reductions in water use during the drought years, though customers behavior returns to pre-drought conditions after the drought. Thus a distribution system must be designed to meet the more conservative demand condition (non-drought).
	a.	*Consultant shall integrate temperature and precipitation forecasts into future demand projections*	
	b.	*Consultant shall prepare a hydrant flow testing plan showing recommended number and locations of proposed hydrants for approval by District. District staff will perform hydrant testing with Consultant oversight and recording of data.*	A Hydrant flow testing plan is used to calibrate the hydraulic model to **steady state**. This is an old-school methodology to calibrate the hydraulic model. It focuses on approximated snapshots in time recorded on hydrant testing forms, and results with approximated steady state calibration. This calibration is adequate for fire flow analysis. Note that the hydrant model output (hydrant schedule) is a separate document and already in use by District Staff. We worked with District staff to perform the more valuable and data intensive **dynamic calibration**. This effort included installing
	c.	*Consultant shall calibrate the model using hydrant test results and communicate any abnormalities or questionable data to the District. This plan and data collected should be included as an appendix in the final report.*	

			pressure loggers in the field, capturing pressures every 15 minutes, and collecting SCADA data from all tanks, booster stations, supply sources. This was very time consuming to District staff and to Akel and resulted with an Extended Period Simulation calibrated dynamic Model. This model calibration is used for fire flow analysis, but more importantly for operational enhancements. In addition, District Staff pressure tested representative hydrants after completion of the Hydrant Schedule to verify usefulness of the schedule. Thus, the District and Akel team worked together and traveled the extra mile for a better calibration, and exceeded the RFP requirements.
	d.	*Consultant shall prepare a set of estimated useful life values for different asset classes and estimate remaining useful life based on installation dates.*	This task was completed in the Risk Assessment portion of the analysis. Facility Age was a factor that was scored, and weighted.
	e.	*Consultant shall prepare projected rehabilitation and replacement needs and costs based on remaining useful life values.*	The risk assessment identified the replacement and renewal needs and prioritized them as follows: • Pipelines in Table 8.16 • Storage Reservoirs in Table 8.17 • Booster Stations in Table 8.18 • Groundwater wells in Table 8.15 • PRVs in Table 8.14
23		*The statement, "An industry standard peak hour to maximum day ratio of 1.5 was applied to the maximum day demand…", should be cited. Please note the RFP task, "Consultant shall calculate water usage for average day, maximum day, and peak hour demand conditions. System-wide production for these conditions will be used to adjust customer water demands before they are allocated to the hydraulic model".*	Please see response to comment 9.a
24		*Older Galvanized Iron pipe (GIP) can contain lead. The Master Plan should prioritize replacement of GIP distribution main or state that none exist. In addition, older Cast iron pipe*	This Risk Assessment framework, including categories for likelihood of failure and consequence of failure were developed with District staff team, and based on available data.

	(CIP) may have lead-packed joints. They should also be prioritized for replacement.	Issues with certain pipe materials were not reported during the establishment of the framework. Nevertheless, in addition to the priorities identified in this master plan, District staff can develop a list of replacements to target a certain material. These can be inserted in the priority lists for the next few years. Alternately, District staff may issue an Amendment to the Water Master Plan, and to update the framework to penalize certain pipe materials, and to update the priorities.
25	*The minimum operating pressure criteria in the Master Plan exceeds regulatory requirements. CCR Title 22, Section 64602 only requires a minimum pressure of 40-psi or new distribution systems that meet the following, "(b) Each new distribution system that expands the existing system service connections by more than 20 percent or that may otherwise adversely affect the distribution system pressure shall be designed to provide a minimum operating pressure throughout the new distribution system of not less than 40 pounds per square inch at all times excluding fire flow." Maintaining or increasing pressure to 40-psi could be good practice, but it is not required to drive pipe replacement.*	The water industry uses minimum pressures which are higher than 20 psi during normal operating conditions, and to provide customers with an adequate level of service. Accordingly, this water master plan used 40 psi criteria during peak hour demands. It should be noted that even with the recommend improvements in this Water System Master Plan, several areas would still experience pressures lower than 35-40 psi, and greatly due to the challenging terrain. An important aspect of the pipeline capacity evaluation in this Water Master Plan was that it identified a largely undersized water distribution network, that needs significant upsizing to meet minimum fire protection requirements, and to meet adequate levels of service to customers. If funding opportunities are not readily available at this time to increase this level of service, then at a minimum, at or near the pipeline "end of life" replacement, District staff may choose replacing these greatly undersized pipelines with more adequate pipe sizes.
26	*Akel Engineering measured the fire flow rate and pressure at the same node in the hydraulic model. They assumed the node with the fire flow would drop to 20-psi first (usually an ok assumption for relatively flat, gridded networks). Note the discrepancies throughout the model, where a downstream node in a non-looped main has higher fire flow rate than an*	The fire flow analysis included reviewing residual pressure availability, duration of fire and storage availability. Several overall maps were provided to illustrate the overall observed deficiencies and documented on Figures 7.3 and 7.4.

		upstream node. This is caused by the fact that the lower elevation nodes have greater potential energy at that point in the system, but it does not equate to higher fire flow rates.	
	a.	*State Code: "Each distribution system shall be operated in a manner to assure that the minimum operating pressure in the water main at the user service line connection throughout the distribution system is not less than 20 pounds per square inch at all times.", see CCR Title 22, Section 64602.*	Please see response to comment 25.
	b.	*Fire Code/Standard: "A primary concern should be the ability to maintain sufficient residual pressure to prevent developing negative pressure at any point in the street mains, which could result in a collapse of the mains or other water system components or back-siphonage of polluted water from other interconnected sources. It should be noted that the use of residual pressures of less than 20 psi (1.4 bar) is not permitted by many state health departments.", see NFPA 291 Section 4.1.5 & 4.1.6.*	Please see response to comment 25.
27		*The fire flow rate criteria used in the Master Plan exceed Code requirements. Minimum fire flow rates are a requirement of new developments. Since sprinklers are required in all new residential single-family homes in California, the District should not expect a need for a fire flow greater than 750 gallons per minute, in single family home residential neighborhoods, see CFC Appendix B105. The District has less than 1/3 of the State's average growth rate (from 2010-2020), the District should be careful to not burden itself with undue expense, see AWWA Manual M31, Section 2, paragraph System Evaluation and Design, "It is recommended that every 5 or 10 years, as a minimum, the water distribution system be thoroughly evaluated for*	Please see response to item 9.d, where we reduced the typical minimum fire flow requirement for single-family homes from 1,500 gpm for 2 hours to 1,000 gpm for 2 hours. Even with sprinkler requirements for new homes, if a pressure zone includes both existing and new single-family homes, the fire flow requirements in that neighborhood shall be the larger fire. During the time of approval for new homes, developers have the opportunity to submit calculations related to their subdivision pipelines to District staff, and based on new sprinkler requirements. Pipelines serving existing single-family residential homes must meet the 1,000 gpm for 2 hours.

	requirements that would be placed on it by development and reconstruction over a 20-year period into the future. A plan should then be developed for meeting that requirement. In this way, individual improvements and individual projects can be evaluated and made to conform generally, to long-term development needs without undue additional expense to either the developer or the utility".	